

The STAR Time Projection Chamber

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The STAR detector is nearly complete. It is undergoing final tune-up and calibration procedures at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory.

At the heart of STAR is the world's largest Time Projection Chamber (TPC). A TPC is a digital camera that can record the tracks of nuclear fragments produced by the collision of two nuclei. The tracks are reproduced in three dimensions by combining 800 sequential 2D images into a single model of the event. The TPC is 4 meters long and 4 meters in diameter.

The TPC was built at the Berkeley Lab and was transported to BNL in November of 1997. Since that time, it has been outfitted with all of its read-out electronics, and was fully integrated with the STAR detector in December 1998 when the TPC was inserted into the STAR magnet.

Figure one shows a cosmic ray entering the STAR detector from above, interacting with the magnet steel, and leaving a shower of curved tracks in the TPC. The figure is an end-view of the cosmic ray tracks in the TPC.

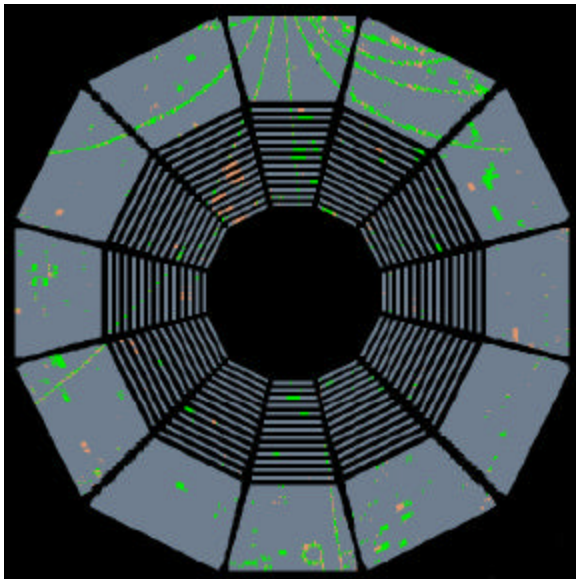


Figure 1: A cosmic ray enters the TPC from the top. This is an end view and the tracks are shown projected onto the TPC readout sectors.

The first opportunity to test the TPC with live beam came in July of 1999 when the RHIC accelerator conducted engineering studies and circulated its first beams. The RHIC engineers succeeded in achieving closed orbits in the "blue" ring of the accelerator and circulated beam in the "yellow" ring despite some mechanical obstructions. This gave us an opportunity to test the TPC and to look for beam interactions.

STAR was the only detector to observe collisions at RHIC during the run. Figure two shows one of the first recorded events. It is a beam-beam pipe collision and it was recorded on July 27th, 1999. The accelerator was set for injection energy, ~12 GeV and the magnetic field in STAR was set to 2.5 kilogauss. The figure shows particles curling up in the magnetic field with momenta ranging from 150 MeV to greater than 1 GeV.

We will soon complete the TPC installation and calibration work and we are preparing for our first scientific data taking run, which is scheduled for June, 2000.

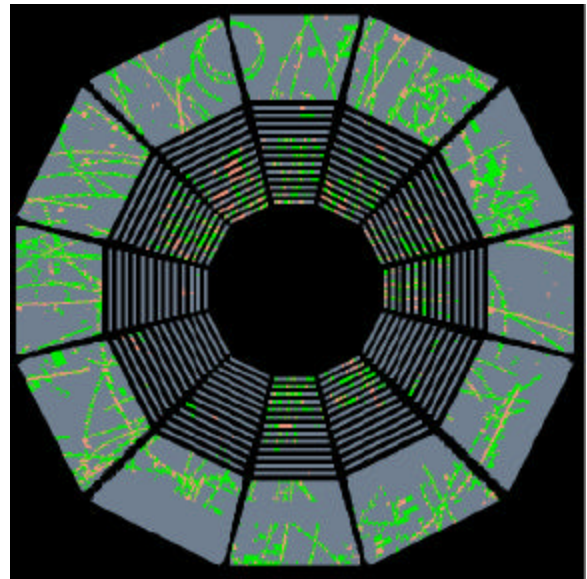


Figure 2: STAR records the first beam beam-pipe collisions observed at RHIC. These data were collected on July 27th, 1999.